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PYCNOGONIDA

BY

W. T. CALMAN, C.B., D.Sc., LL.D., F.R.S.
(Lately Keeper of Zoology)

WITH TEN TEXT-FIGURES

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The Pycnogonida obtained by the Expedition are referred to fourteen species, of which six are described as new. Among the latter the species of *Eurycyde* and *Cilunculus* are of interest because of their well-marked characters, and because they belong to genera including only a few other species. The form described as *Callipallene echinata* is provisionally allotted to the genus *Callipallene*, but it presents several unusual features that will probably require its removal to a new genus when the accumulation of adequate material allows a revision of the related genera.

Of the other species identified in the collection, *Rhopalorhynchus kröyeri*, already known to range from Queensland to the Maldives and the Persian Gulf, was found in the Red Sea, the Gulf of Aden, and off the South Arabian Coast. It is abundant in some localities in shallow water.

The names given to the species of *Nymphon* recorded below are to be regarded merely as provisional determinations. They do no more than record the existence in these waters of a number of closely related forms, whose specific identity, mutual relations and geographical range will remain uncertain until someone with access to abundant material of fully adult specimens will produce a revision of the tropical and northern species like that provided by Dr. Gordon for the Antarctic members of the genus.

The most interesting species in the collection from a geographical point of view is *Colossendeis angusta*, from deep water in the Gulf of Aden. As pointed out below, this species has an extremely wide distribution, always in cold water at great depths, and it seems likely that its presence in the Gulf of Aden can be correlated with large-scale movements of the bottom water.

LIST OF SPECIES.

Family Colossendeidæ.
Colossendeis angusta, G. O. Sars.
Rhopalorhynchus kröyeri, Wood-Mason.
Family Eurycydidæ.
Eurycyde extenuata, sp. n.
Family Nymphonidæ.
Nymphon andamanense, Calman.
,, *foxi*, Calman.
,, *arabicum*, sp. n.

Family Phoxichilidæ.
Callipallene pectinata (Calman).
,, (?) *echinata*, sp. n.
Parapallene longipes, sp. n.
Family Phoxichilidiidæ.
Pallenopsis brevidigitata, Möbius.
Family Endeidæ.
Endeis mollis (Carpenter).
Family Ammotheidæ.
Achelia echinata, Hodge.
Ciluncuius sewelli, sp. n.
Family Pycnogonidæ.
Pycnogonum africanum, sp. n.

Colossendeis angusta, G. O. Sars.

G. O. Sars, 1877, p. 368 (error for 268); *id.*, 1891, p. 140, pl. xv, fig. 2, *a–f*; Topsent, 1891, p. 178; Möbius, 1902, p. 191, pl. xxix, figs. 6–13; Bouvier, 1917, p. 8.
C. gracilis Hoek, 1881, p. 69, pl. ix, figs. 6–8, pl. x, figs. 6 and 7; Schimkéwitsch, 1893, p. 32.
C. gracilis var. *pallida*, Schimkéwitsch, 1893, p. 33, pl. ii, fig. 25.

Occurrence.—St. 185, Gulf of Aden, 2000 m. Bottom temperature probably 3·5° to 4° C. (Sewell). 2 ♀.

Distribution.—Perhaps world-wide, always in cold water and (except in the Arctic) at considerable depths. With reference to the present specimens Lt.-Col. Seymour Sewell remarks (*in litt.*), "I think that without doubt the species has come along with the Antarctic Bottom Drift up the East Coast of Africa or else with the deep Atlantic water that enters the Indian Ocean round the Cape of Good Hope".

Remarks.—I follow Topsent, Möbius and Bouvier in identifying Hoek's *C. gracilis*, from between the Crozet Islands and Kerguelen, with Sars's *C. angusta* from the North Atlantic and Arctic. Möbius's record of the "Valdivia" specimen (which Bouvier, by a slip, attributes to the "Siboga") from 2959 metres off Dar-es-Salaam, bottom temperature 2° C., forms a link between the new record from the Gulf of Aden and Hoek's locality in the far South, 1375–1600 fathoms, temperature 0·8° to 1·5° C.

Schimkéwitsch's identification of *C. gracilis* and a variety *pallida* from "Albatross" dredgings off the west coast of Central America provides the only other certain record outside the North Atlantic and the Arctic, but if *C. brevipes* and *C. media* are to be included, as Hoek suspected, the South Atlantic and the South-East Pacific must be added to the range of the species.

Möbius was justified in suspecting an error in Hoek's statement that the third pair of legs are the longest in *C. gracilis*. In the "Challenger" types, as in *C. angusta* from the North Atlantic and in the specimens in the present collection, the second pair are the longest.

Specimens of *C. angusta* from the North Atlantic are much larger than Hoek's types and the legs are relatively shorter. The ocular tubercle is lower and more rounded. The specimens now recorded agree with those of Hoek. The ocular tubercle is tall and acute and, although there is no pigment, the anterior pair of eyes at least are clearly indicated.

The relative length of the legs is much less than in the specimen recorded by Möbius, those of the second pair being a little less than four times the total length of the body and proboscis.

As described by Hoek, one of his co-types retains the chelophores, but it has not been mentioned that the other two show scars marking the place of articulation of these deciduous appendages. The scars are still more plain in large specimens from the North Atlantic, but the present specimens show no distinct trace of them.

Rhopalorhynchus kröyeri, Wood-Mason.

Calman, 1923, p. 268, text-fig. 1 (with synonymy).

Occurrence.—St. M.B. (*b*) 17.ix.33, Red Sea, 29 m., 11 spms. St. M.B. (*d*) 17.ix.33, Red Sea, 26 m., 61 spms. St. 27, 12.x.33, Gulf of Aden, 37–91 m., 1 spm. St. M.B. II*b*, 28.x.33, S. Arabian coast, 29 m., 1 spm.

Recorded Distribution.—Port Denison, Queensland (Haswell); Torres Straits (Carpenter); Andamans (Wood-Mason); N.E. of Ceylon, 88 fms. (Calman); Maldives and Saya de Malha, 47 fms. (Carpenter); Muscat (Calman).

Remarks.—The specimens in this collection afford no reason for modifying the synonymy given for this species (Calman, 1923, p. 268). All of them show characters of the *gracillimus* type, the proboscis being drawn out anteriorly, with the dorsal tooth well back on the inflated part. The claw on the legs is always between one-half and two-thirds of the length of the propodus.

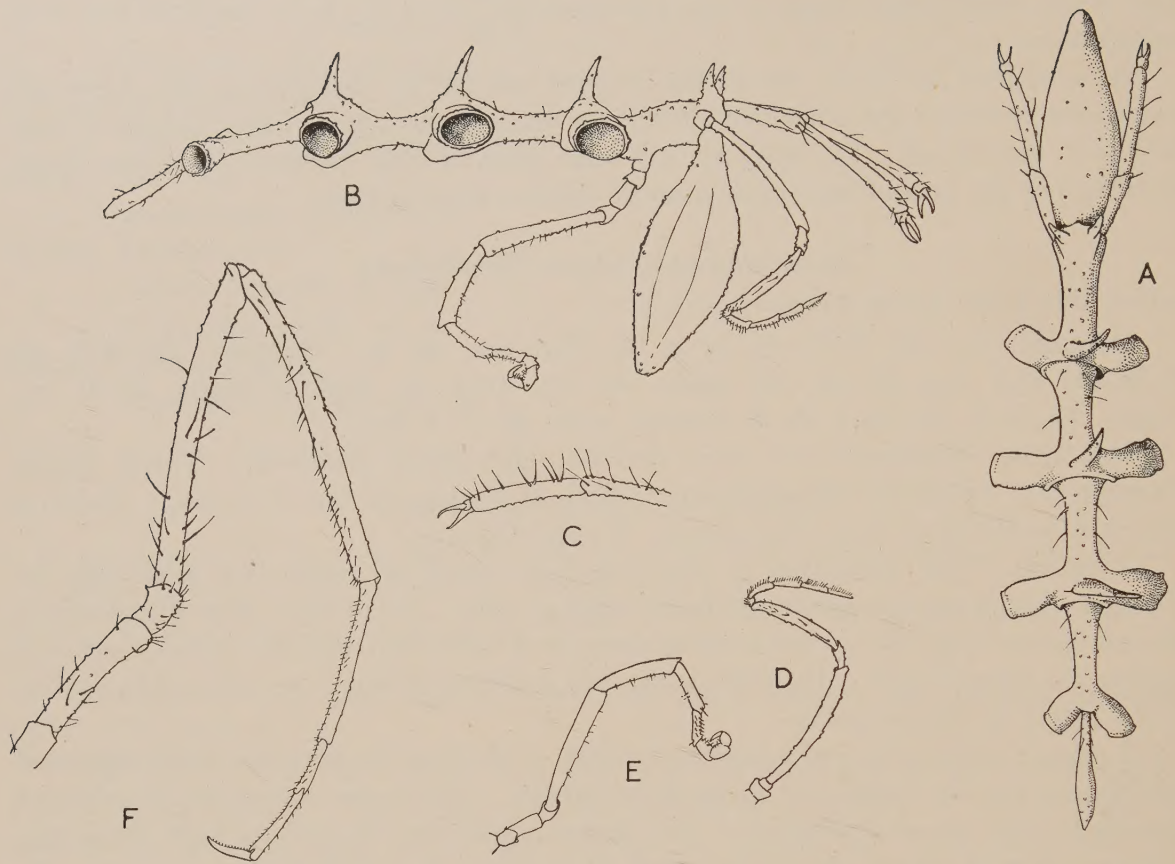
I cannot confirm Loman's statement (1908, p. 26) that the sexes are easily separated by differences in the length and shape of the femora. Specimens recognized as males and females by the size and position of the genital apertures (that of the male being very minute and much nearer the distal margin of the coxa than that of the female) have the femora precisely similar. Possibly the more clavate femora of the female figured by Loman are characteristic of a later stage of maturity.

Eurycyde extenuata, sp. n.

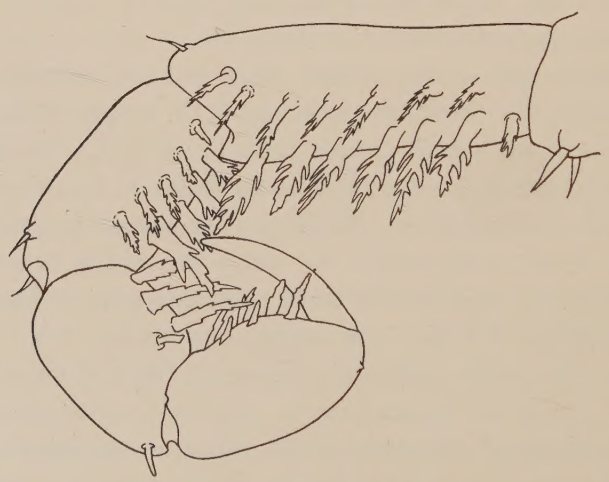
Occurrence.—St. 120, Zanzibar area, 2926 m., 3 ♀. St. 121, Zanzibar area, sounding 925 m., " net apparently not at bottom ", 1 ♀.

Description.—Body and limbs beset with minute scattered tubercles. *Trunk* slender and much elongated. Cephalic segment little longer than the second or third somite, each of which is again a little longer than the fourth. Neck about one-fourth of width across the first lateral processes, little expanded in front where a pair of spines overhang the bases of the chelophores. Width across second lateral processes more than one-third of length of trunk, and nearly six times the width between second and third processes. Distance between second and third processes about three times the diameter of the processes. Cephalic and two succeeding segments each with a median dorsal spine on hind margin. No ocular tubercle. Each of the last three segments cylindrical in front of the lateral processes, expanding to the wide articulation with the preceding segment. *Proboscis* fusiform, deflexed, with minute scattered tubercles. *Abdomen* slender, cylindrical, bluntly pointed, reaching to middle of second coxa of last legs.

Chelophores shorter than proboscis; scape of two segments, the first about two-thirds as long as the second; chela minute, the acutely pointed fingers curved, apparently incapable of apposition.



TEXT-FIG. 1.—*Eurycyde extenuata*, sp. n. A, Dorsal view of body with chelophores. B, Lateral view of body with chelophores, palp, and oviger. C, Chelophore. D, Palp. E, Oviger. F, Third leg of right side.



TEXT-FIG. 2.—*Eurycyde extenuata*, sp. n. Terminal segments of oviger further enlarged.

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Palps longer than proboscis, second segment not quite twice as long as fourth, fifth shorter than any of the following four, which are subequal.

Ovigers inserted a little way in front of the first lateral processes. Fourth segment twice as long as fifth.

Legs.—Femur a little shorter than first tibia, which is twice as long as second. Carpus nearly two-thirds of propodus.

Measurements in mm. :

Length of proboscis	3·0
,, trunk	6·0
,, abdomen	1·35
,, chelophore	2·25
Third right leg :	
First coxa	0·6
Second ,,	1·7
Third ,,	0·6
Femur	3·8
First tibia	4·0
Second ,,	2·0
Tarsus	0·6
Propodus	1·0
Claw	0·4

Remarks.—Loman (1908, p. 29) distinguished the genus *Eurycyde* from *Ascorhynchus* by two characters only, the stalked proboscis and the longer chelophores, both of which he admitted to be unsatisfactory. In the two species which he described from the " Siboga " collections the " stalk " of the proboscis is much less distinct than in the genotype *E. hispida*, and hardly more so than the basal part that is defined from the body of the proboscis by a groove in most species of *Ascorhynchus*. The present species, in which this groove is hardly perceptible, is referred to *Eurycyde* only because the long and slender chelophores give it an aspect very different from that of any species of *Ascorhynchus*. It resembles *E. virago*, Loman, in having the insertion of the ovigers widely separated from that of the palps, but it differs in the dorsal spines of the body-somites and in the paucity of hairs on the body and limbs.

Nymphon andamanense, Calman.

Calman, 1923, p. 273, fig. 4.

Occurrence.—St. 45, S. Arabian Coast, 40 m., 2 spms.

Distribution.—Andaman Is.

Remarks.—The two specimens are probably males, although the genital pores could not be observed. They are larger than the holotype (length of trunk 4·2 mm.), and differ conspicuously from it in having the second free somite not longer than the first. Although the second tibia is longer than the first the difference is not so great as in the holotype. The terminal segment of the palp is distinctly shorter than the preceding. The chela has the fingers more curved, the teeth on them longer, and the palm less instead of more than two-thirds as long as the fingers. The setigerous cushion on the underside of the chela at the base of the immovable finger is more pronounced than in the holotype.

In all these points and in being irregularly sprinkled with minute spots of dark pigment, the specimens are intermediate between the holotype and Carpenter's *Nymphon maculatum* from the Red Sea. In the latter species, however, the neck is so greatly elongated and there are so many other differences of proportion that its distinctness from *N. andamanense* seems to be beyond doubt. If it be assumed that the elongation of the second free somite in the holotype of *N. andamanense* was an individual peculiarity, there seems no valid reason to forbid the reference of the present specimens to that species.

The spine formula of the ovigers is, in the larger specimen, 19, 12, 10, 11, and, in the smaller, 16, 12, 9, 10.

Nymphon foxi, Calman.

Calman, 1927, p. 403, fig. 102.

Occurrence.—St. 45, S. Arabian Coast, 40 m., 2 ♀, 1 juv.

Distribution.—Suez Canal.

Remarks.—The female specimens are about twice the size of the male type and differ from it in having the bi-papillate ocular tubercle a good deal taller, the chelophores with longer palm and shorter and more numerous teeth on the fingers ($\frac{26}{33}$ as against $\frac{13}{12}$), femur shorter than first tibia and less than three-fourths of second, main claw more than one-third of propodus and little longer than auxiliaries. The spines on the last four segments of the ovigers are 10, 8, 8, 10 as against 9, 9, 6, 7.

Nymphon arabicum, sp. n.

Occurrence.—St. 43, S. Arabian coast, 83 m., 3 ♂, 3 ♀. St. M.B. IIc, S. Arabian coast, 29 m., 1 ♀.

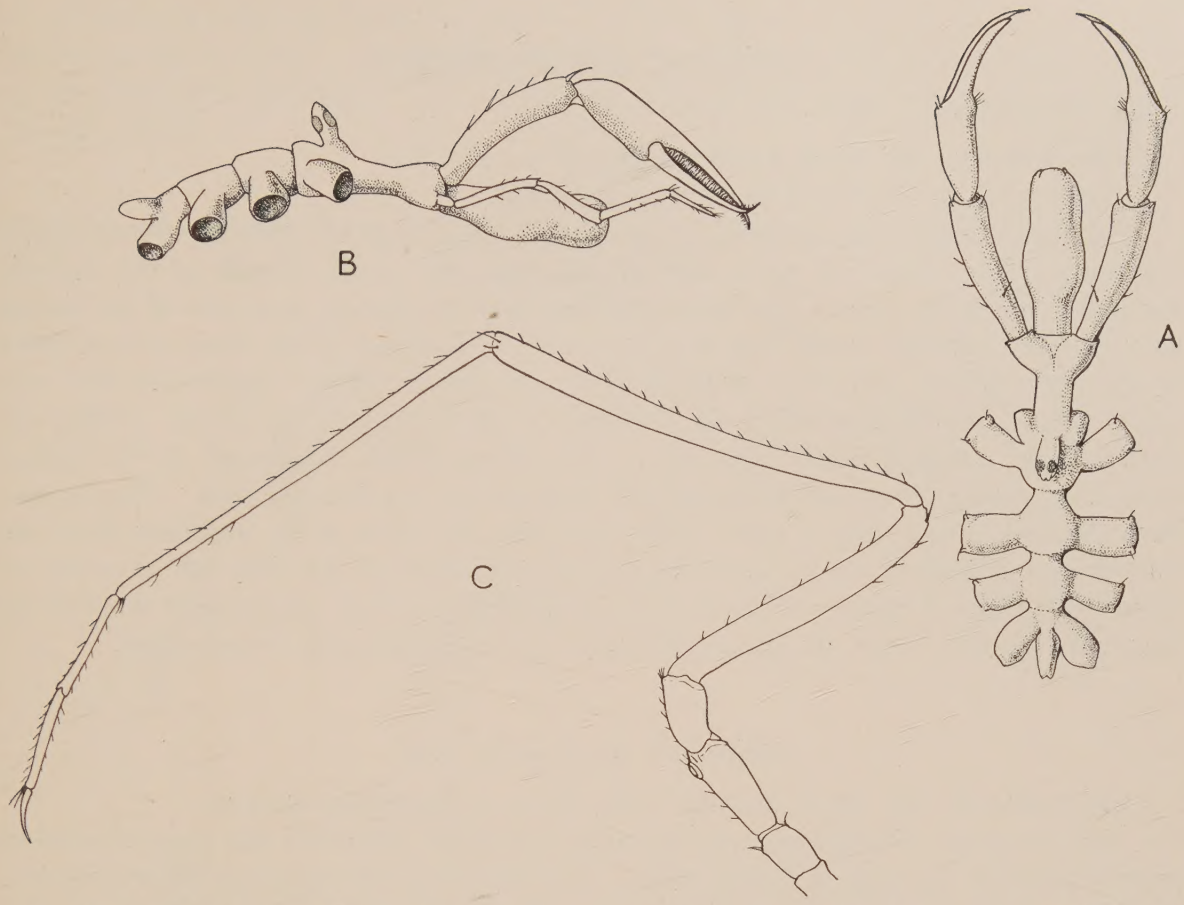
Description.—Body not very slender. Cephalic segment about half the length of the trunk; width at base of chelophores about $2\frac{1}{2}$ times diameter of neck. Lateral processes separated by intervals of more than half their diameter. Abdomen about as long as last pair of processes. Proboscis, from above, nearly as long as cephalic segment, with a distinct swelling about the middle of its length, where the diameter is greater than at either end. Ocular tubercle tall, with two apical papillæ close together. Eyes large, well defined.

Chelophores with hand as long as scape; palm twice as long as wide and two-thirds as long as fingers, which are curved and have close-set teeth, 64 on movable and 35 on immovable finger.

Palps slender, second segment little longer than third or fourth; fifth less than three-fourths of fourth.

Ovigers of male with distal process on fifth segment bearing setæ. Spine formula 15, 10, 9, 10.

Legs slender, not conspicuously hairy, second coxa twice as long as first and one-half longer than second. Femur two-thirds of first tibia, which is about equal to second. Tarsus slightly longer than propodus, which is about ten times as long as wide. Claw half as long as propodus and more than twice as long as auxiliaries.



TEXT-FIG. 3.—*Nymphon arabicum*, sp. n. A, Dorsal view of body with chelophores. B, Lateral view of body with chelophore and palp. C, Third leg of right side.

Measurements in mm. :

Length of proboscis (above)	1·75
,, trunk	3·0
,, abdomen	0·5
Second right leg :	
First coxa	0·6
Second ,,	1·25
Third ,,	0·8
Femur	3·6
First tibia	5·6
Second ,,	5·5
Tarsus	1·4
Propodus	1·2
Claw	0·6

REMARKS.—This species is clearly distinct from any hitherto described from the Indo-Pacific area. In the form of the chela it shows some resemblance to *N. pixellæ*, Scott (1912, p. 207), with which *N. solitarium*, Exline, is synonymous (1936, p. 414). In that species, however, the tarsus of the legs is at least twice as long as the propodus.

*Callipallene** *pectinata* (Calman).

Pallene pectinata Calman, 1923, p. 275, fig. 5.

Occurrence.—St. 45, S. Arabian coast, 40 m., 1 ♂, 3 ♀.

Distribution.—Indian Seas, locality uncertain.

Remarks.—The male specimen is a good deal larger than the holotype (trunk-length 1·3 mm.). The " neck " is more marked, although the relative length of the cephalic segment is much the same. The legs of the first pair are missing, but those of the second pair have the auxiliary claws with four, five or six teeth, those of the third with no teeth or one very minute, and those of the fourth pair with no teeth. Apparently the only other significant difference from the holotype is that the last two trunk somites are separated by a very distinct articulation. The spines of the ovigers are of the *Pallene* type, *i. e.* broadly ovate and finely toothed, and there is no terminal claw. The females have the neck rather shorter than in the male, and the teeth on the auxiliary claws are smaller and difficult to see. In one female the auxiliaries of the first legs have two or three teeth, those of the second three, those of the third two very minute, and those of the fourth are without teeth. In all cases the last two trunk-segments are separated.

Callipallene (?) *echinata*, n. sp.

Occurrence.—St. 45, S. Arabian coast, 40 m., 1 ♂ carrying embryos.

Description.—*Trunk* short, the lateral processes well separated, the interval between second and third less than half their width; last two somites not separated by articulation. Cephalic somite about equal to rest of trunk; width in front greater than its length, and about twice the diameter of the short neck. Ocular tubercle taller than broad, obtusely pointed with conspicuous lateral papillæ; eyes well defined. *Proboscis* less than twice as long as wide, nearly cylindrical, bluntly rounded in front; surface hispid with short setæ. *Abdomen* about half as long as the trunk.

Chelophores short and stout; scape much shorter than the chela, each finger with eight large and rather closely-set teeth.

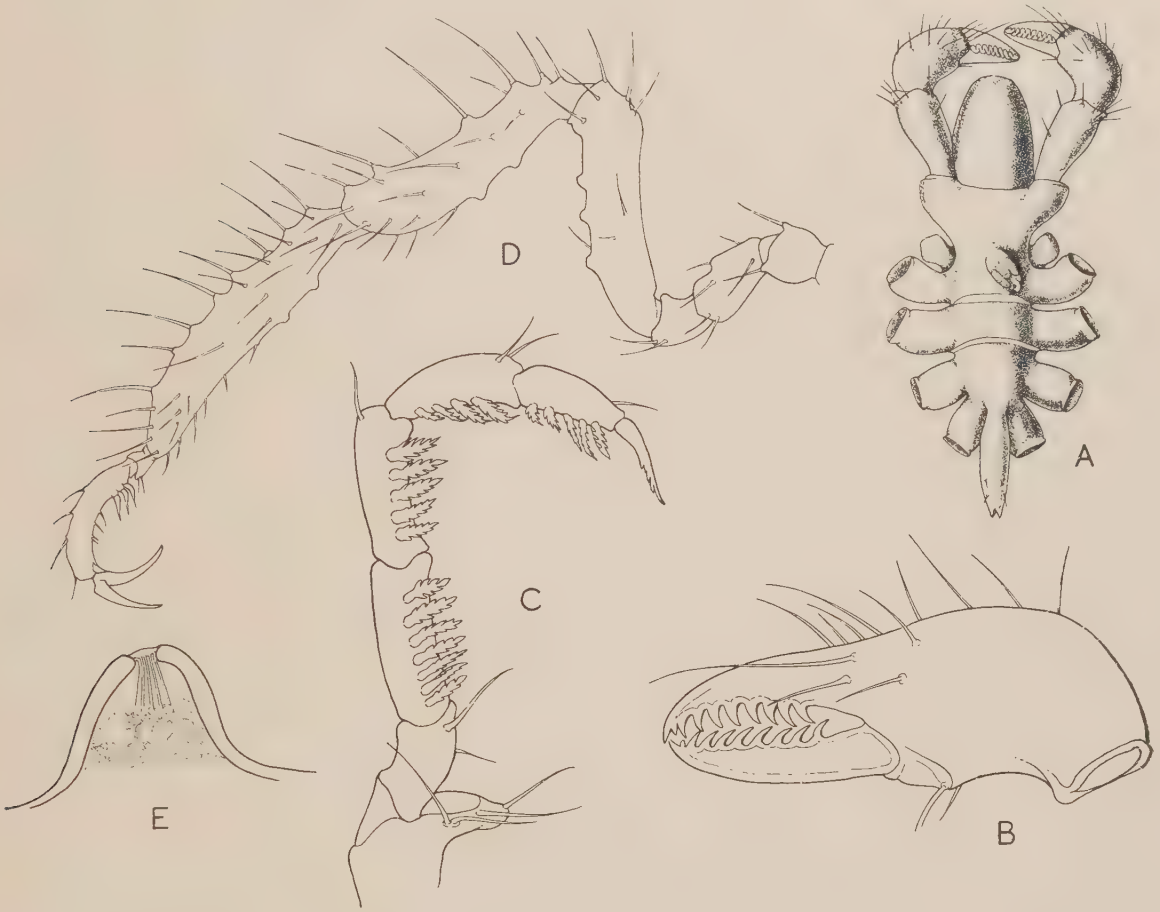
Ovigers with well-marked setigerous process at distal end of fifth segment. Spines of last four segments lanceolate, deeply and coarsely toothed; numbers 7, 5, 4, 5. Last segment with a strong curved pectinate claw.

Legs rather short, with the carpus and propodus much more slender than the preceding segments. Femur slightly shorter than first tibia and much shorter than second. Distal segments especially beset with strong, stiff setæ or spines mostly implanted on tubercular elevations. On the ventral surface of femur and both tibiæ is a row of truncated tubercles arranged as follows:

	Leg.			
	I.	II.	III.	IV.
Femur	4	3	3	3
Tibia I	2	3	2	1
Tibia II	2	2	2	2

* This name has been substituted for the preoccupied *Pallene* by Flynn (1929, p. 252).

These tubercles are hollowed distally where they are perforated by a number of minute pores, to which a bundle of fine ducts can be traced. These appear to correspond to the cribriform openings of the cement glands in *Phoxichilidium* and some species of *Anoplodactylus*.



Text-fig. 4.—*Callipallene echinata*, sp. n. A, Dorsal view of body with chelophores. B, Chela. C, Terminal segments of oviger. D, Third leg of left side. E, Opening of cement gland on femur, further enlarged.

The propodus is curved, with three (or two) large spines proximally. The main claw is more than half as long as the propodus and the auxiliaries more than two-thirds as long as the main claw.

Measurements in mm.:

Length of proboscis (above) . .	0·35
,, trunk	0·95
,, abdomen . . .	0·42
,, cephalic segment . .	0·5
Width of cephalon . . .	0·55
,, neck	0·3

Third left leg:

First coxa	0·16
Second ,,	0·4
Third ,,	0·2
Femur	0·94
First tibia	1·0
Second ,,	1·13
Tarsus and propodus	0·46

Remarks.—This species differs in important points from all hitherto described in the Palleninæ, and its reference to the genus *Callipallene* is only provisional. In having the last two somites fused, auxiliary claws present, and the fingers of the chelophores toothed, it agrees with Loman's (1908, p. 42) diagnosis of *Pallene*, but in the coarsely denticulated spines of the oviger and the presence of a terminal claw it agrees with *Parapallene*, while in having no rudiments of the palps it differs from the group of aberrant species for which Loman provides no name.

If the truncated tubercles on the legs are rightly interpreted as marking the openings of the male cement glands, they differ in two important points from those of most Pycnogonida. They are found not only on the femur but also on the first and second tibiæ. In all Pycnogonida in which these glands have been described they are confined to the femur, with the single exception of *Parapallene hospitalis*, Loman, where they extend into the first tibia. Further, the openings of the glands are remarkable in being on the *ventral* surface of the legs. In most Pycnogonida the openings are on the dorsal surface, but Dohrn (1881, p. 199) describes the single opening in *Neopallene campanellæ* as ventral, and it is ventral also in at least some species of *Pallenopsis* (Calman, 1923, p. 281, fig. 8). It seems likely that the ventral position of the openings will furnish a character of some systematic value.

Parapallene longipes, sp. n.

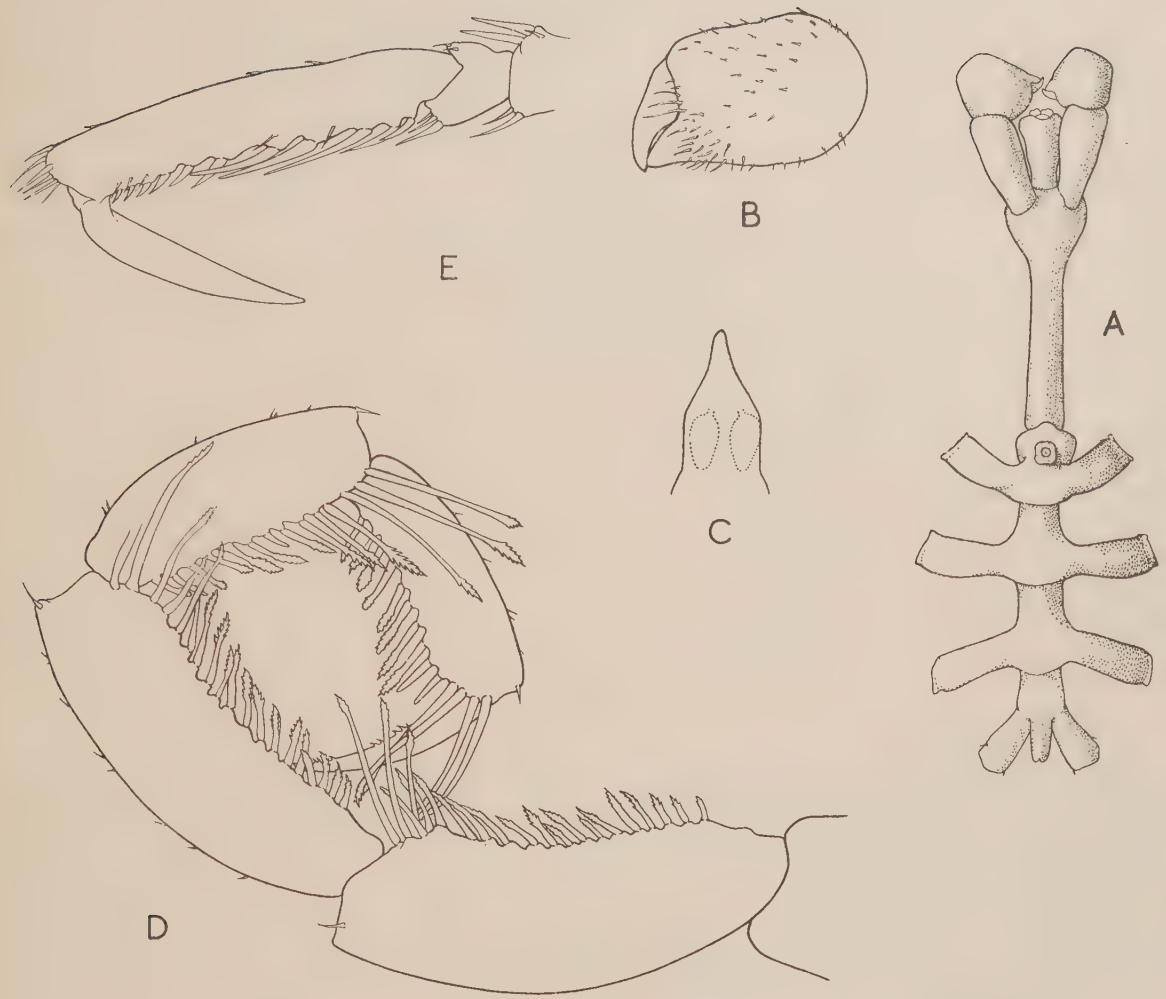
Occurrence.—St. 106, Zanzibar area, 183–194 m., 1 ♀.

Description.—*Body* slender and elongated; width between lateral processes not more than half the length of the latter, which are separated by at least twice their own diameter. Cephalic segment nearly half as long again as the rest of the trunk; width at base of chelophores two and a half times diameter of neck; neck defined by a fold of the exoskeleton which on the dorsal surface has all the appearance of an articulation, but on the ventral becomes merely a shallow groove; it lies just in front of the attachment of the ovigers and, on the dorsal surface, is obtusely angulated forwards. *Ocular tubercle* with rather tall, acute apex. *Proboscis* dilated at the tip; mouth small with projecting lips. *Abdomen* little more than half the length of last pair of lateral processes.

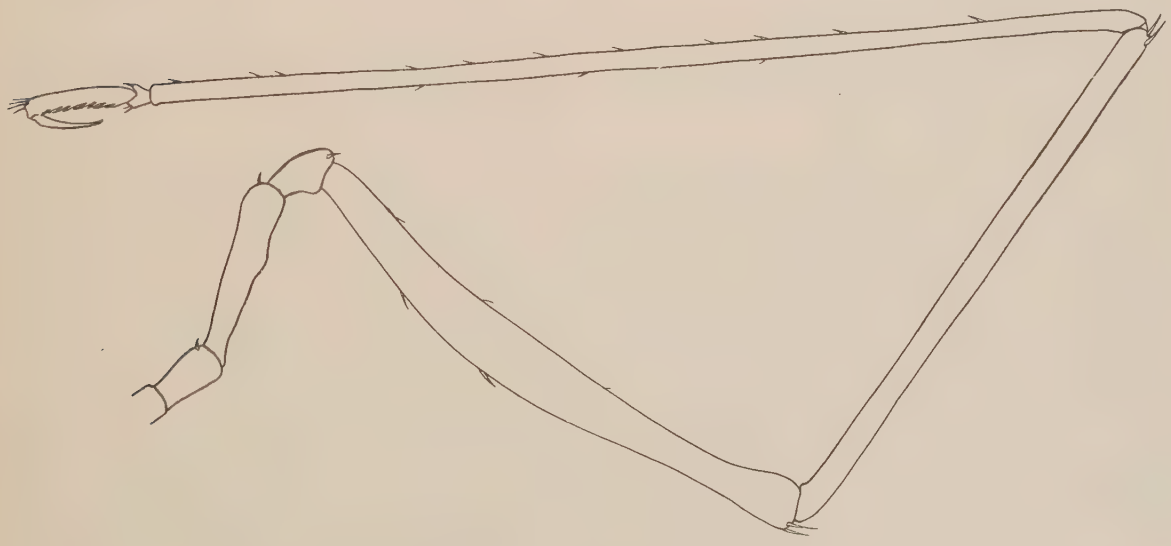
Chelophores with scape about twice as long as wide; chelæ inflated, hispid, fingers short, not toothed.

Ovigers with spines of terminal segments slender, narrowly lanceolate, finely serrated on both edges, becoming very long and slender distally on each segment; numbers 20, 19, 14, 14. Terminal claw finely pectinated on concave edge.

Legs very long, without spines or setæ on proximal segments, with few and scattered



TEXT-FIG. 5.—*Parapallene longipes*, sp. n. A, Dorsal view of body with chelophores. B, Chela. C, Ocular tubercle from front. D, Terminal segments of oviger. E, Carpus and propodus of third leg.



TEXT-FIG. 6.—*Parapallene longipes*, sp. n. Third leg of right side.

spines distally. First coxa longer than third and less than half as long as second. Femur and first tibia equal, second tibia about $1\frac{3}{4}$ as long. Propodus rather slender, claw two-thirds as long, no auxiliary claws.

Measurements in mm.:

Length of proboscis (above)	1·1
,, trunk	8·0
,, cephalic segment	4·75
Width at base of chelophores	1·5
,, of neck	0·65
Third right leg:	
First coxa	1·25
Second ,,	2·75
Third ,,	1·0
Femur	10·3
First tibia	10·5
Second ,,	17·2
Tarsus and propodus	2·0

Remarks.—This species agrees with *Parapallene australiensis* (Hoek), the type of the genus, in all the characters regarded by Loman (1908, p. 42) as distinctive of *Parapallene*, and it may therefore be referred to that genus. It belongs to a group of species including, besides the genotype, *P. nierstraszi*, Loman, in which the neck is long and marked off behind by a fold of integument simulating a true articulation. Whatever the morphological significance of this fold may be (the first leg-bearing somite is not free from the head in any other Pycnogonid), Flynn (1928, p. 18) was in error in supposing there to be any difference in respect of this character between *P. australiensis* and *P. nierstraszi*.

I have elsewhere (1937, p. 530) discussed the characters of *P. australiensis* and have described a new species, *P. challengeri*, which clearly belongs to the same group, but infringes the generic diagnosis by possessing auxiliary claws.

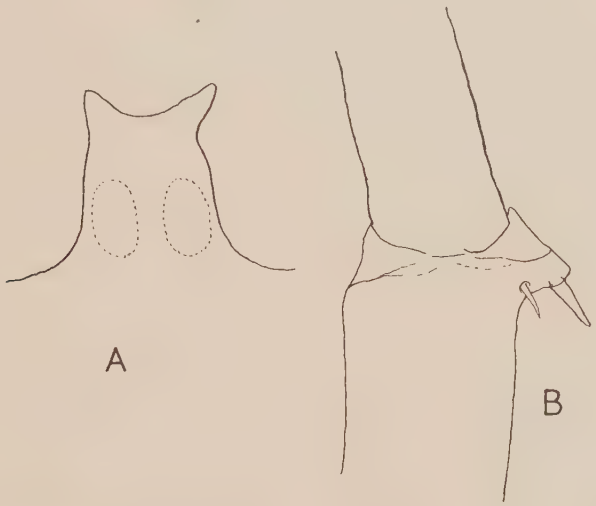
By the kindness of Prof. L. F. de Beaufort I have been allowed to borrow one of the syntypes of *P. nierstraszi* from the Zoological Museum, Amsterdam, and I give here some notes on it.

P. nierstraszi, Loman: Loman describes the four syntypes as females, but the one I have examined is, I think, undoubtedly a male. Like Loman I have been unable to detect the opening of the cement gland, but the genital apertures, although very minute and difficult to see, are present on the second coxæ of all the legs. More important, perhaps, as indicating the sex is the presence at the distal end of the fifth segment of the oviger of a distinct, though small, lateral process, bearing a large spine pointing obliquely backwards, flanked by two smaller ones (Text-fig. 7).

Loman's figure represents fairly well the general aspect of the specimen, but does not show clearly the spines on the body and legs. Each transverse process bears distally behind the middle of the dorsal surface a short spine set on a conical elevation; smaller spines are set in front of and behind it. The first coxa has three spines distally, the second coxa has two conspicuous spines near the base and it and the following three

segments have each a distal group of stiff spines ; the second tibia is spinous rather than hairy.

The ocular tubercle is described by Loman as having " zwischen den Augen eine feine konische Spitze ". In the specimen examined, however, it terminates in two prominent, well-separated, conical tubercles (Text-fig. 7). The spines on the ovigers are slender, finely serrated on both edges, increasing in length distally on each segment but not so markedly as in *P. longipes*. Formulæ 9, 10, 9, 9 and 11, 10, 8, 10.



Text-fig. 7.—*Parapallene nierstraszi*, Loman. Syntype. A, Ocular tubercle from front. B, Junction of fifth and sixth segments of oviger.

Measurements in mm. :

Length of proboscis (above)	1·03
,, trunk	6·32
,, cephalic segment	3·5
Width at base of chelophores	1·0
,, of neck	0·4
Third left leg :	
First coxa	1·05
Second ,,	3·5
Third ,,	1·05
Femur	6·9
First tibia	6·9
Second ,,	8·8
Tarsus and propodus	1·5

It is possible, and indeed likely, that when further specimens are available for examination, the differences between the species mentioned will appear less marked, but for the present *P. longipes* may be distinguished from *P. australiensis* and *P. nierstraszi* by the much greater relative length of the legs and especially of the second tibia, and by the absence of conspicuous spines on the proximal segments of the legs and on the transverse processes. It is further distinguished from *P. nierstraszi* by the single apex of the ocular tubercle.

Pallenopsis brevidigitata, Möbius.

Möbius, 1902, p. 185, pl. xxvii, figs. 7–13; Flynn, 1928, p. 19, fig. 9.

Occurrence.—St. 107, Zanzibar area, 421–457 m., 1 ♂, ovig.

Distribution.—Off Dar-es-Salaam, 404 m., and off Natal, 46 fms.

Remarks.—The figures given by Möbius are clearly inaccurate in several particulars. For example the palp-rudiments are omitted from his Fig. 8, although they are described in the text as "kurz, kegelförmig, so lang wie breit". Again, the auxiliary claws are omitted from Fig. 9 and they are not mentioned in the specific description, although they are included in the generic diagnosis on p. 184. Dr. A. Schellenberg has been good enough to re-examine the type-specimens, and to send me a sketch of the foot showing minute auxiliary claws as in Flynn's figure.

The segmentation of the *Trunk* is marked only by lines of colour with no perceptible grooving of the integument. The *Abdomen* extends only to about two-thirds of the length of the last lateral processes. The difference in size of the anterior and posterior eyes is hardly perceptible.

Chelophores.—Viewed from above the second segment of the peduncle is much more than half the length of the first.

Ovigers.—The sixth segment is dilated as described by Möbius.

Legs.—Third legs more than nine times as long as the trunk. Auxiliary claws very small, about one-seventh of length of main claw.

Endeis mollis (Carpenter).

Phoxichilus mollis, Carpenter, 1904, p. 182, plate, figs. 1–7.
Endeis mollis, Calman, 1923, p. 293, fig. 16.

Occurrence.—St. 45, off S. Arabia, 38 m., 1 ♂, 1 ♀. "Hydroid colonies" are mentioned among the contents of the dredge at this station, and it is to be presumed that the specimens of *Endeis* were feeding on these.

Distribution.—Muscat to Tonga Is. (Calman, 1923).

Remarks.—These specimens have the second tibia longer than the femur, the penultimate segment of the oviger expanded, the femur straight and its lateral spines inconspicuous and most of the other spines greatly reduced. In these characters they agree with most of the specimens which I have referred (*loc. cit.*) to Carpenter's species. They differ from them in the greater length of the proboscis, which in one specimen is equal to the body and in the other nearly so. The spine-bearing tubercles at the end of the femur are not prominent, and the cement glands are 30 in a single row. In the male the proboscis measures 3·2 mm., the body 3·6, and the third right leg 17·5 mm., the femur and the two tibiæ being 4·2, 3·9 and 4·9 mm. long respectively.

Achelia echinata, Hodge.

Ammothea (*Achelia*) *echinata*, Bouvier, 1923, p. 55.

Occurrence.—St. M.B.(*d*), Red Sea, 26 m., 1 ♀. St. 27, Gulf of Aden, 37–91 m. "In association with a finely branched Cœlenterate, apparently Antipatharian." 1 ♂.

Distribution.—Norway to Cape Verde Is., Mediterranean, New England coast.

Remarks.—The male from St. 27 measures 1·38 mm. in total length and shows all the characters enumerated by Bouvier as distinctive of this species. I have also compared it with specimens from the British coasts without finding any notable differences except that the palps seem to be relatively shorter in the present specimen.

The female from the Red Sea is minute (total length 0·8 mm.) and doubtless juvenile, but apparently belongs to the same species.

While recording these specimens under the name of Hodge's species, it should be pointed out that there are several species described from the Indo-Pacific region whose characters require further investigation. Ortmann's *Ach. echinata* var. *japonica* does not seem to be very closely related. Loman's *A. nana* from the Malay region is very similar to Hodge's species, but would appear to be distinguished by the very slender claws of the legs. In that species and in *A. aspera*, Loman, from Australia, the ocular tubercle is much shorter than in *A. echinata*.

Cilunculus sewelli, sp. n.

Occurrence.—St. 118, Zanzibar area, 1789 m., 1 ♀.

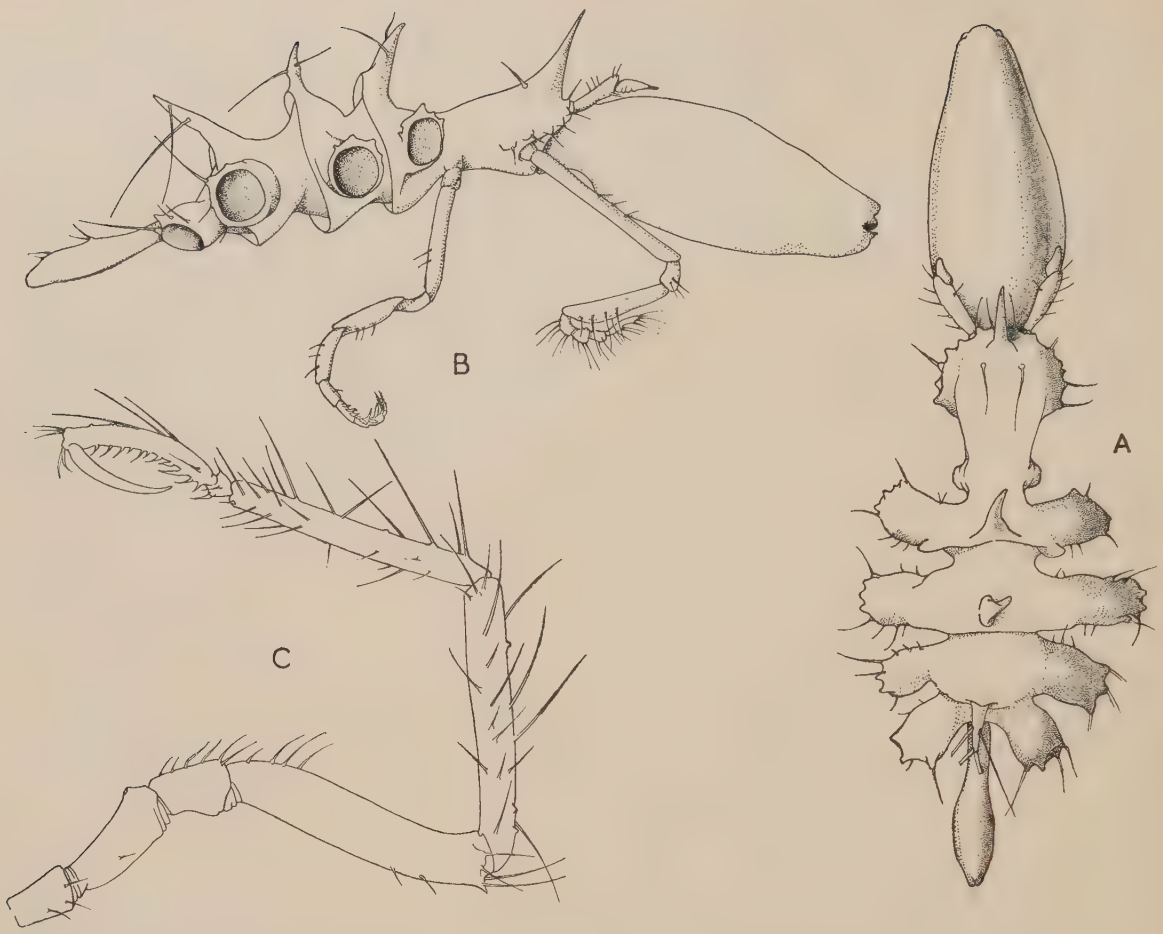
Description.—Body with scattered long hairs which become more numerous on the legs. *Trunk* distinctly and loosely articulated, the last three somites contracted in front of the lateral processes, then expanding to the anterior margin, which fits into the spacious articular cavity with everted edges of the somite in front (*cf.* Loman's *C. perspicax*, 1908, pl. vii, fig. 97). Cephalic somite longer than the three succeeding, expanded in front into a semicircular hood tuberculated on the margin and overhanging the bases of the chelipeds and palps; on the hind margin just in front of the everted edge a slender acute dorsal spine. Lateral processes each with three distal tubercles, the middle one the largest, each bearing a seta. Insertion of ovigers well in front of first lateral processes. Second and third somites each with a dorsal spine. The lateral processes are separated by less than their diameter, but the loose articulation of the somites suggests that a good deal of contraction should be allowed for. *Ocular tubercle* tall, slender, acute, just behind anterior margin; no eyes visible. *Proboscis* ovate, rather broadly rounded at the tip. *Abdomen* slightly clavate, less than half as long as trunk.

Chelipeds extending to less than one-third of length of proboscis; scape of two segments, the first very short and hidden by the hood. Chela acutely pointed and slightly curved distally. Movable finger represented by a small spike.

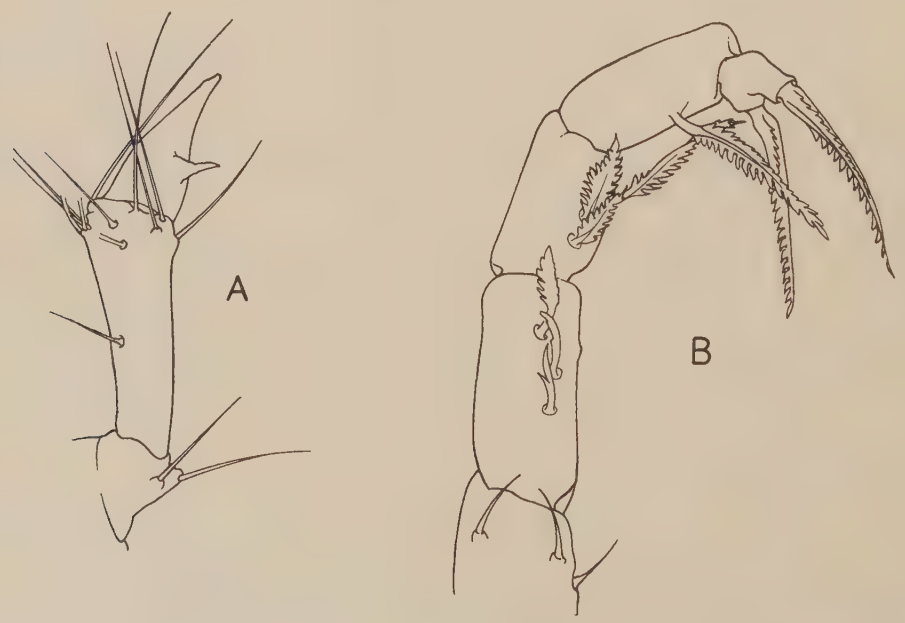
Palps doubly geniculate, of nine segments, the fourth slightly inflated, a little more than half as long as second; last five short, expanding distally on ventral side, so as to give a slightly serrate edge to this part of the palp.

Oviger rather short and slender, of ten segments. Terminal segment very minute, without claw, with two large serrate spines; ninth segment with one spine, eighth and seventh segments with three spines each.

Legs moderately slender, femora little dilated. The three coxæ together, the femur, and the first and second tibiæ subequal. Propodus about five-eighths of second tibia; claw curved, about three-quarters of propodus; auxiliaries about one-quarter of main claw. The legs of the first pair are missing, but genital openings are present on all the other pairs.



TEXT-FIG. 8.—*Cilunculus sewelli*, sp. n. A, Dorsal view of body with chelophores. B, Lateral view of body with chelophore, palp and oviger. C, Third leg of right side.



TEXT-FIG. 9.—*Cilunculus sewelli*, sp. n. A, Chelophore. B, Terminal segments of oviger,

Measurements in mm.:

Length of proboscis (above)	3·3
,, trunk	3·6
,, abdomen	1·5
Width across second lateral processes	2·7
Third right leg:	
First coxa	0·8
Second ,,	1·1
Third ,,	0·8
Femur	2·7
First tibia	2·7
Second ,,	2·7
Tarsus and propodus	1·8

Remarks.—This species seems to be undoubtedly congeneric with Ortmann's *Parazetes pubescens* (1890), which Loman (1911) identifies with Böhm's *Lecythorhynchus armatus* and refers to his own genus *Ciliunculus*, of which one of the leading characters is the growing forward of the anterior margin of the head "wie ein Schutzdach über die kleinen Cheliforen". Loman describes and figures the chelophores as having an unsegmented scape, although Böhm mentions and Ortmann clearly figures the short spinose basal segment. Böhm's species has the anterior "hood" produced into two long spiniform processes, and among other characters distinguishing it from the present species it has the auxiliary claws some two-thirds as long as the main claw.

Pycnogonum africanum, sp. n.

Occurrence.—St. 106, near Zanzibar, 183–194 m., 1 ♀ (holotype). St. 119, near Zanzibar, 1228 m., 1 ♀ (paratype).

Description of Holotype.—Integument brown, shagreened with minute granules, some of which are tipped with spines; marked with reticulate tracts of darker colour forming a definite pattern on the body and less conspicuously on the legs.

Trunk with three transverse ridges each with a tall, slender median spine. Lateral processes distinctly separated, each with three distal tubercles, the middle one spiniform. Cephalic segment a little longer than the two following somites together; front margin overhanging base of proboscis as a collar. Width across first and second lateral processes about equal. Ocular tubercle taller than wide, bluntly conical; eyes distinct but not pigmented.

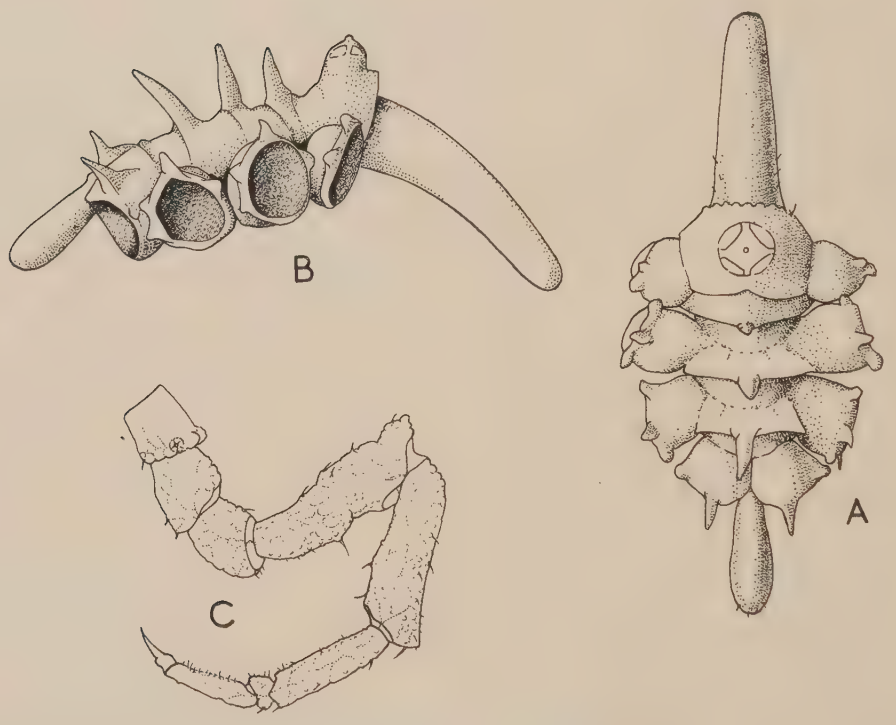
Proboscis rather slender, decurved, narrowing gently to blunt, rounded tip.

Abdomen subcylindrical, nearly reaching distal end of second coxa of last leg.

Legs with first coxa not twice as wide as long, with two tubercles on posterior half of distal margin. Femur with a distal projection bifurcated at the tip. Second tibia a good deal more slender than the first. Third right leg nearly three times as long as the trunk.

Measurements of holotype in mm.:

Length of proboscis	3·2
Width of proboscis at base	0·96
Length of trunk	3·58
,, abdomen	1·37
Third right leg:	
First coxa	0·7
Second ,,	0·95
Third ,,	0·6
Femur	2·1
First tibia	2·0
Second ,,	1·5
Tarsus and propodus	1·45
Claw	0·6



TEXT-FIG. 10.—*Pycnogonum africanum*, sp. n. A, Dorsal view of body. B, Lateral view of body. C, Third leg of right side.

DESCRIPTION OF PARATYPE.—Integument pale, its texture resembling that of holotype. *Trunk* having the first dorsal ridge with only a low tubercle, second with a taller acute process, third with a long, slender spine. Lateral processes without distinct tubercles. Ocular tubercle produced above the indistinct eyes into a tall acute spine. *Abdomen* slightly surpassing second coxa of last leg. *Legs* with femur distally produced into a shorter anterior and a longer posterior tubercle. First tibia with two subequal distal prominences.

Measurements of paratype in mm.:

Length of proboscis . . .	2·5
,, trunk	3·2
,, abdomen . . .	1·3
Third right leg:	
Total length	9·4

Remarks.—The distinction between "téguments chagrinés" and "téguments réticulées" on which Bouvier (1922, p. 113) bases his primary division of the species of *Pycnogonum* (and of *Pentapycnon*) is not absolute. Flynn (1919, p. 92) has already described in *P. aurilineatum* a "shagreened" species showing traces of reticulation. In Flynn's species, however, as in that now described, the network is less conspicuous than it is in the species of Bouvier's "reticulated" group.

Assuming that this species falls into the division A of Bouvier's key, then in having the legs not conspicuously tuberculated, the proboscis a truncate cone, the abdomen bluntly rounded posteriorly and dorsal tubercles on the body, it approaches *P. crassirostre*, Sars, and *P. occa*, Loman. The tall and acute dorsal tubercles and the slender decurved proboscis separate it from the former. With the latter the resemblance is closer, but the wide separation of the lateral processes, the distinctly clavate abdomen and the much longer claw on the legs sufficiently distinguish Loman's species.

The paratype from St. 119, although only a little smaller than that from St. 106, appears to be more immature since no genital apertures could be observed. Possibly attributable to this immaturity are the tall, acute, ocular tubercle (as in young *Achelia*) and the distal processes on the femur and first tibia. The only remaining character distinguishing it from the holotype is the reduction of the first median dorsal process of the body.

REFERENCES.

Böhm, R. 1879. Ueber die Pycnogoniden d. kgl. zool. Mus. Berlin. Monatsber. Akad. Berlin, 1879, pp. 170–195, 2 pls.

Bouvier, E. L. 1917. Pycnogonides provenant des campagnes scientifiques de S.A.S. le Prince de Monaco, 1885–1913. Rés. Camp. scient. . . . Monaco, LI, 56 pp., 4 pls.

—— 1922. Classification et caractères distinctifs essentiels des Pycnogonides appartenant à la série des Pycnogonomorphes. Ann. Sci. Nat. Zool. (10) V, pp. 113–117.

—— 1923. Pycnogonides. Faune de France, VII, pp. 1–69, text-figs.

Calman, W. T. 1923. Pycnogonida of the Indian Museum. Rec. Indian Mus. Calcutta, XXV (3), pp. 265–299.

—— 1937. The Type-specimens of *Pallene australiensis* Hoek (Pycnogonida). Ann. Mag. Nat. Hist. (10) XX, pp. 530–534, text-figs.

Carpenter, G. H. 1904. Report on the Pantopoda. Rep. Ceylon Pearl Oyster Fisheries, Royal Society, Pt. II, Suppl. Rep. xiii, pp. 181–184, 1 pl.

Exline, Harriet I. 1936. Pycnogonids from Puget Sound. Proc. U.S. Nat. Mus. LXXXIII, pp. 413–422, text-figs.

Flynn, T. Thomson. 1919. Two new Australian Pycnogonida. Pap. Proc. Roy. Soc. Tasmania, 1918, pp. 91–100, pls. xiii, xiv.

—— 1928. The Pycnogonida of the Marine Survey of South Africa. Fisheries and Marine Biol. Survey, Union of S. Africa, Rep. VI for 1927–1928, Special Reps. No. 1, pp. 1–36, text-figs.

—— 1929. Pycnogonida from the Queensland Coast. Mem. Queensland Mus. IX (3), pp. 252–260, text-figs.

Hoek, P. P. C. 1881. Report on the Pycnogonida dredged by H.M.S. "Challenger" during the years 1873–76. "Challenger" Reports, Zool. III, 167 pp., 21 pls.

Loman, J. C. C. 1908. Die Pantopoden der Siboga-Expedition. Siboga Exp. Monogr. XL, 88 pp., 15 pls.

—— 1911. Japanische Podosomata. (Beitr. Naturg. Ostasiens . . . Doflein.) Abh. math. phys. K. Bäyer. Akad. Wiss. Suppl. Bd. II, Abh. 4, pp. 1–18, 2 pls.

Möbius, K. 1902. Die Pantopoden der deutschen Tiefsee-Expedition 1898–1899. Wiss. Ergebn. d. deutschen Tiefsee-Exp. . . . "Valdivia" 1898–1899, III (6), pp. 175–196, pls. xxiv–xxx.

Ortmann, A. 1890. Bericht über die von Herrn Dr. Döderlein in Japan gesammelten Pycnogoniden. Zool. Jahrb. Abth. Syst. V, pp. 157–168, pl. xxiv.

Sars, G. O. 1877. Prodromus descriptionis Crustaceorum et Pycnogonidarum . . . Arch. Math. Naturvid. II, pp. 337 (=237)–271.

—— 1891. Pycnogonidea: The Norwegian North-Atlantic Expedition, 1876–1878. XX. Zoology, 163 pp., 15 pls., 1 chart.

Schimkéwitsch, W. M. 1893. Compte-rendu sur les Pantopodes. Reports . . . "Albatross" . . . 1891. Bull. Mus. Comp. Zool. Harvard, XXV (2), pp. 27–43, 2 pls.

Scott, Flora M. 1912. On a species of *Nymphon* from the North Pacific. Ann. Mag. Nat. Hist. (8) X, pp. 206–209, pl. vii.

Topsent, E. 1891. Les Pycnogonides provenant des campagnes du yacht l'*Hirondelle* 1886–87–88 (Golfe de Gascoigne, Terre-Neuve, Açores). Bull. Soc. zool. France, XVI, pp. 187–180.